1.0 INTRODUCTION

Weston Solutions, Inc. (WESTON®) prepared this Draft Remedial Investigation (RI) Report as part of the requirements of Contract Number 99-0017-AN with the Arizona Department of Environmental Quality (ADEQ), Task Assignment 99-0148. The purpose of the Work Assignment is to complete the RI of West Central Phoenix (WCP) East Grand Avenue Water Quality Assurance Revolving Fund (WQARF) Site, with a focus on the former Van Waters & Rogers (VW&R) facility as the primary source of the groundwater contamination (Figure 1-1). Additional sources of contamination are discussed in Section 7.6.2. The RI is being conducted for ADEQ and funded by the Arizona WQARF.

1.1 SITE BACKGROUND

In 1982, a volatile organic compound (VOC), trichloroethene (TCE), was detected in several City of Phoenix (COP) municipal wells located in WCP (Figure 1-1). Subsequent groundwater sampling confirmed the presence of TCE at concentrations above the U.S. Environmental Protection Agency (EPA) Maximum Contaminant Levels (MCLs). ADEQ subsequently designated the area of groundwater contamination as the WCP WQARF area and recommended further study under the State Superfund WQARF program. The WCP WQARF area was placed on the WQARF Priority List in 1987.

In 1998, the following five WQARF Registry Sites were established within the WCP WQARF area pursuant to Arizona Revised Statutes (ARS) §49-287.01:

- West Osborn Complex Site
- West Grand Avenue Site
- East Grand Avenue Site
- North Canal Site
- North Plume Site

The VW&R facility is located within the WCP East Grand Avenue WQARF Site. Contaminants known to be present in the groundwater at levels above regulatory limits include the chlorinated solvents TCE, tetrachloroethene (PCE), and 1,1-dichloroethene (1,1-DCE).

1.2 FACILITY HISTORY

The VW&R facility is located in the southeast ¼ of the southwest ¼ of the northeast ¼ of Section 26, Township 2 North, Range 2 East of the Gila and Salt River Base Line and Meridian in Maricopa County, Arizona. VW&R was a chemical distribution firm that operated at 2930 West Osborn Road in Phoenix, Arizona (Figures 1-1 and 1-2) from 1957 to 1970. Van Waters & Rogers, Inc. was incorporated in the state of Washington in 1924 and dissolved in 1966 when it merged with United Pacific Corporation and was incorporated in the state of Delaware as "VWR United Corporation". "VWR United Corporation" changed its name to Univar Corporation (Univar) in 1974 (HLA, 1995). Univar had changed their name to Vopak USA but is currently known as Univar once again.

From approximately 1957 until the mid-1960s, site operations consisted primarily of warehousing and distribution of inventory maintained by Braun-Knecht-Heimann Company (BKH), a subsidiary company (HLA, 1995). BKH was a distributor of scientific and laboratory apparatus and equipment. In the mid-1960s, facility operations expanded to include warehousing and distribution of industrial and agricultural chemical products, upholstery supplies, and laundry and dry cleaning supplies.

VW&R operated at West Osborn Road from 1957 until Motor Rim & Wheel Service of California, now known as Century Wheel & Rim, purchased the property in 1970. At that time, VW&R moved the operation to its current location at South 45th Avenue in Phoenix and discontinued activities at the West Osborn Road facility. Century Wheel & Rim continues to occupy the property, but the current owner is Bakala Investment Properties, L.L.C.

1.2.1 Chemical Handling and Storage

In 1969, VW&R installed two aboveground, 7,500-gallon fiberglass storage tanks (Figure 1-2). These tanks were used for storage and repackaging of ferric chloride and hydrochloric acid. The tanks were installed on a concrete slab surrounded by a soil containment berm in the northeastern portion of the property (Vopak, 2000). VW&R continued to use the storage tanks under a rental agreement after Motor Wheel & Rim purchased the property. The tanks were in use until approximately 1971 when VW&R arranged for their removal. VW&R also reported that two small tanks for methylethyl ketone (MEK) and acetone might have been present in a covered shed area. The location of the covered shed was not given but is assumed to be the former building foundation (Figure 1-2).

Chemical products were mainly received into inventory and distributed to customers in containers pre-packaged by the product manufacturers; however, repackaging of 15 different compounds did occur at the facility (Vopak, 2000). The identity of 10 of these compounds is known and includes ferric chloride, hydrochloric acid, sulfuric acid, caustic soda, antifreeze, acetone, MEK, aqueous ammonia, chloroethene (also known as vinyl chloride), and TCE. VW&R was not sure of the identity of the five remaining repack products; however, they believed PCE might also have been repacked at the facility (Vopak, 2000).

Repackaging occurred at three locations on the facility (Figure 1-2). The main tanker truck and rail tank car repackaging area was located east of the former building foundation. Repackaging occurred on the west side of the former building foundation when the main repackaging area was busy. Repackaging of the aboveground storage tank (AST) products occurred south of the tanks. The following steps were followed in the repackaging process (Vopak, 2000):

- Empty drums were lined up in a row and then the first empty drum would be placed on a portable scale.
- The bungs were removed from the top of each drum and the drum would be labeled to reflect the chemical that was to be repacked.
- One end of an approximate 1-1/2- to 2-inch chemical transfer hose was attached to the tanker truck, rail car, or storage tank. The other end of the hose had a valve handle and spigot.

- The spigot was placed in the hole on the top of the first drum located on the scale and the drum was filled to the desired weight.
- The repack person checked the level of liquid in the drum and then walked down the line of drums and filled each of them to the same level in a process known as "squirt filling".
- At the end of drumming, the repack person attempted to drain the chemical remaining in the hose into one of the drums being repacked and the hose was then disconnected from the tank truck.
- The bungs were tightened on the drums.
- The chemical transfer hose was washed out with water and the rinsate would be allowed to flow onto the asphalt in the repack area.

Once repackaged, drums available for resale were stored primarily inside the warehouse, as well as under and near the shed. Full drums were also stored along the east and west fence lines between the warehouse and the shed (Vopak, 2000).

Empty drums were stored on the northwest corner of the facility prior to being shipped to the drum recycler (Figure 1-2) (Vopak, 2000). Although the drums were not routinely washed at the facility, some of the empty drums were rinsed if additional cleaning was needed prior to recycling. The rinsate was typically poured on the soil east of the empty drum storage area (Figure 1-2). Although not a common practice, VW&R believes that occasionally non-saleable product may have been released in the same general location as the empty drum rinsate (Vopak, 2000).

1.2.2 Chemical Releases

VW&R has reported some minor accidental releases (Vopak, 2000). The following incidents reportedly occurred at the facility. Dates of each incident were not given:

- Ammonium hydroxide—one weekend during the summer, ammonium hydroxide drums were stacked three pallets high (four drums per pallet). The drums on the bottom pallet ruptured due to the heat and all the pallets collapsed, resulting in a release.
- Caustic soda leak—approximately 100 gallons of caustic soda was spilled by a third-party driver during the off loading process.
- Ferric acid—the repack person was accidentally sprayed with ferric acid during the repackaging process.

- Punctured drums—occasionally, drums would be punctured by forklifts and limited amounts of various products would be released.
- Repackaging spills—incidental spills would occur when repackaging bulk products.

1.3 PREVIOUS INVESTIGATIONS

Previous investigations at the VW&R facility have included soil-gas surveys, subsurface soil sampling, and groundwater sampling. These investigations are summarized in the following sections.

1.3.1 CERCLA Site Inspection (ADEQ, 1993)

In 1993, ADEQ conducted a Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Preliminary Assessment (PA) and Site Inspection (SI) on behalf of the EPA (ADEQ, 1993a). Historical records and information obtained by ADEQ indicated that VW&R stored and distributed various chemicals at the 2930 West Osborn Road facility. Site reconnaissance at the facility revealed a dry well behind the northeast corner of the existing building (Figure 1-2). The SI report indicated the dry well was thought to be approximately 3 to 4 feet deep but there has been no subsequent information that confirms the depth of the dry well. Vopak indicated the dry well was believed to have been installed to control water runoff (Vopak, 2000). Also noted during the site reconnaissance were two areas of discolored soil, which included the area between the main building and east fence line and the area south of the drum storage area.

ADEQ also reviewed historical aerial photographs showing the two ASTs, numerous drums, and several areas of stained soil on the subject property. Aerial photographs from 1964 indicated drums were present on the northeast corner of the main building and along the west fence line. Numerous drums appeared to be scattered approximately 200 to 300 feet north of the main building and along the east fence line in a 1971 aerial photograph. The surrounding ground surface also appeared to be stained or discolored.

As part of the CERCLA SI, ADEQ collected samples of surficial and sub-surface soil and soil-gas samples from 15 locations at the facility (Figure 1-3). The locations were chosen by the

ADEQ based upon their review of the aerial photographs and a site reconnaissance. Soil-gas samples were collected at an approximate depth of 5 feet below ground surface (bgs), surficial soil samples were collected from 6 to 12 inches bgs, and subsurface soil samples were collected at depths ranging from 6 to 8 feet bgs.

Semivolatile organic compounds (SVOCs), including polycyclic aromatic hydrocarbons (PAHs), phthalates, metals, and pesticides, were detected in the surficial soil samples. Phthalates are common laboratory contaminants and were not considered contaminants of concern at the facility. Various PAHs were detected at concentrations exceeding the existing Health Based Guidance Levels (HBGLs) at the time of the investigation. Dichlorodiphenyldichloroethene (4,4-DDE) and dichlorodiphenyltrichloroethane (4,4-DDT) were the pesticides with the highest detected concentrations. The concentrations, however, were below the existing HBGLs at the time. Metals were present in all of the surficial soil samples, but were detected at concentrations below or near the background concentrations for the facility.

TCE, PCE, 1,1-DCE, 1,1,1-trichloroethane (1,1,1-TCA), ethylbenzene, and toluene were detected in the soil-gas samples. Soil-gas samples collected beneath the former AST, storage drum, and stained soil areas identified in the aerial photographs indicated detections of TCE, PCE and 1,1-DCE at concentrations up to three times the background level. Background levels were determined by analytical results from soil-gas samples collected from two locations on the south side of the building. These locations were selected as background because no apparent historical facility activities were conducted there (ADEQ, 1993a).

TCE, PCE and 1,1,1-TCA were detected in approximately half of the subsurface soil samples. The concentrations of these VOCs, however, were below the existing HBGLs at the time. No groundwater samples were collected as part of the ADEQ SI.

1.3.2 Soil-Gas Survey (HLA, 1994)

At the request of the ADEQ, Univar, the parent company of VW&R in 1994, agreed to perform a preliminary site characterization of their former property. The first phase of site characterization was a soil-gas survey conducted by Harding Lawson Associates, Inc. (HLA) in July 1994 (HLA,

1994). The survey included collection of 51 soil-gas samples (Figure 1-4). The locations of the samples were determined based on an approximate 50-foot grid that covered the entire property. Additional samples were collected from locations adjacent to the dry well located on the property. All soil-gas samples were collected at an approximate depth of 5 feet bgs. The survey identified elevated concentrations of PCE, TCE, and 1,1-DCE in almost all of the soil-gas samples collected from locations near the central portion of the facility (Figures 1-4, 1-5, and 1-6). HLA concluded that analysis of soil-gas collected from locations adjacent to the dry well indicated that the area around the dry well did not appear to be impacted by previous site activities.

At the end of the survey, HLA proposed a second phase of site characterization that included additional subsurface soil investigation in areas that exhibited high VOC concentrations in the soil-gas.

1.3.3 Subsurface Soil Investigation and Risk Assessment (HLA, 1995)

On behalf of Univar, HLA performed a subsurface soil investigation and risk assessment at the VW&R facility in December 1994 (HLA, 1995). The investigation was performed to evaluate site lithology, nature and extent of VOC contamination in soil, and to evaluate the potential human health and environmental risks related to the presence of VOCs in subsurface soils at the facility. The subsurface investigation involved advancing seven soil borings to depths ranging from 87.5 to 100 feet bgs (Figure 1-7). The locations of the borings were determined by elevated VOC concentrations in the soil-gas detected during the soil-gas survey performed by HLA earlier in 1994.

Soil samples were collected from the borings at 5-foot intervals. Samples were submitted to an off-site laboratory for VOC analysis based upon photoionization detector (PID) screening results, sample depth, and lithologic type. Of the 122 soil samples collected during the subsurface investigation, HLA submitted 38 soil samples collected from the unsaturated zone for laboratory analysis. In addition, one sample collected from the capillary fringe in SB-2 was also submitted

for laboratory analysis. Groundwater was encountered only in SB-2 at approximately 97 feet bgs.

Earth Technology Corporation (Earth Tech) was contracted by the ADEQ to oversee the subsurface investigation. Thirteen split samples were collected by Earth Tech during the investigation and were submitted to a separate off-site laboratory for VOC analysis. Twelve of these samples were collected from unsaturated soil and one sample (VWR-SB2-95.5) was collected from the capillary fringe.

The following table summarizes the results of the soil investigation. Only those samples that had detections are listed below. No other contaminants were detected above the method detection limit (MDL) in any of the other samples.

Soil Boring	Sample Depth (feet bgs)	Sample Date	Collected by	PCE (µg/kg)	TCE (µg/kg)	1,1,1-TCA (µg/kg)	Freon 11 (µg/kg)
ADEQ GPL				1,300	610	1,000	NE
ADEQ R SRL				53,000	27,000	1,200,000	380,000
ADEQ NR SRL				170,000	70,000	4,800,000	1,300,000
SB-2	65	12/14/94	HLA	<5.0	<5.0	<5.0	<5.0
SB-2	61	12/14/94	Earth Tech	***95***	<50	<50	<50
SB-2	95 *	12/14/94	HLA	***140***	***80***	<5.0	<5.0
SB-2	95.5 *	12/14/94	Earth Tech	***140***	<50	<50	<50
SB-3	56	12/20/94	HLA	<5.0	<5.0	<5.0	***12***
SB-3	70.5	12/20/94	HLA	<5.0	<5.0	<5.0	***13***
SB-4	60.5	12/19/94	HLA	***9.8***	***18***	<5.0	<5.0
SB-4	86	12/19/94	Earth Tech	<50	<50	***130***	<50
SB-6	21	12/12/94	HLA	***6.6***	<5.0	<5.0	<5.0
SB-6	56	12/12/94	HLA	***11***	***17***	<5.0	<5.0
SB-6	70.5	12/12/94	HLA	***44***	***44***	<5.0	<5.0
SB-7	91	12/19/94	Earth Tech	<50	<50	***86***	<50

* Indicates samples collected at the capillary fringe.
Bold values are detections above MDLs
Freon 11 = Trichlorofluoromethane

µg/kg = micrograms per kilogram
NE = none established
ADEQ NR SRL = ADEQ Non-residential Soil Remediation Level
ADEQ R SRL = ADEQ Residential Soil Remediation Level
ADEQ GPL = ADEQ Groundwater Protection Levels (default values)

After reviewing the analytical results, HLA concluded that the VOC concentrations detected in the unsaturated soil were attributable to soil-gas migration from an off-site source. HLA attributed the VOCs detected in the capillary fringe to impacts from contaminated groundwater from off-site sources (HLA, 1995).

As part of the soil investigation, HLA performed a risk assessment to assess the potential for human health effects and groundwater impacts associated with VOCs detected in soils at the VW&R facility. The risk assessment used a conservative vadose zone transport model (VLEACH) developed for the EPA by CH2M Hill in 1990 to evaluate impacts to groundwater. The conclusion of the risk assessment was that "…the level of VOCs present in site soils does not pose a human health risk and would not impact groundwater quality" (HLA, 1995).

At the conclusion of the subsurface investigation and risk assessment, HLA stated that no further action was necessary at the facility and recommended that case closure be given from the ADEQ. ADEQ reviewed the report and prepared a comment letter dated May 25, 1995, which stated that the investigation was considered incomplete without analytical results from upgradient and downgradient monitor wells to provide information concerning groundwater conditions beneath the VW&R facility.

1.3.4 Phase I Remedial Investigation (Fluor Daniel, 1997)

In 1997, ADEQ contracted Fluor Daniel GTI, Inc. (Fluor Daniel) to install and sample three groundwater monitor wells, WCP-15, WCP-16, and WCP-17, at the VW&R facility as part of a Phase I RI (Fluor Daniel, 1997). Soil samples were collected during the drilling of the monitor wells from three depth intervals in each boring. Soil samples were collected from the vadose zone (approximately 20 feet bgs), from a confining layer (70 to 80 feet bgs), and from the capillary zone (90 to 100 feet bgs). Figure 1-8 shows the locations of the Phase I monitor wells.

The following table summarizes the results of the PCE and TCE analyses conducted on soil samples during drilling of the wells.

Well ID	Sample Date	Sample Depth (feet bgs)	PCE (µg/kg)	TCE (µg/kg)
ADEQ GPL			1,300	610
ADEQ R SRL			53,000	27,000
ADEQ NR SRL			170,000	70,000
WCP-15	3/18/1997	20-21.5	***65***	<50
WCP-15	3/18/1997	80-81.5	<50	<50
WCP-15	3/18/1997	100-101.5 *	<50	<50
WCP-16	3/17/1997	20-21.5	<50	<50
WCP-16	3/17/1997	70-71.5	***65***	***98***
WCP-16	3/17/1997	100-101.5 *	***88***	***120***
WCP-17	3/19/1997	20-21.5	<50	<50
WCP-17	3/19/1997	80-81.5	<50	<50
WCP-17	3/19/1997	100-101.5 *	<50	<50

bgs = below ground surface
Bold values are detections above MDLs
* = Samples collected at 100-101.5 feet bgs were collected in the capillary zone
ADEQ NR SRL = ADEQ Non-residential Soil Remediation Level
ADEQ R SRL = ADEQ Residential Soil Remediation Level
ADEQ GPL = ADEQ Groundwater Protection Levels (default values)

On March 28 and April 29, 1997, monitor wells WCP-15, WCP-16, and WCP-17 were sampled. Samples were collected after a minimum of three well casing volumes were purged, unless the well was purged dry. The following table summarizes the results for PCE, TCE, and 1,1-DCE.

Well ID	Sample Date	PCE (µg/L)	TCE (µg/L)	1,1-DCE (µg/L)
EPA MCL		5	5	7
Arizona AWQS		5	5	7
WCP-15	3/28/1997	***380***	***210***	***65***
WCP-15	4/29/1997	***430***	***270***	***80***
WCP-16	3/28/1997	***1,700***	***2,700***	***290***
WCP-16	4/29/1997	***1,500***	***2,600***	***270***
WCP-17	3/28/1997	***470***	***1,100***	***180***
WCP-17	4/29/1997	***470***	***1,100***	***170***

EPA MCL = EPA Maximum Contaminant Level
Arizona AWQS = Arizona Aquifer Water Quality Standard
µg/L = Micrograms per liter
Bold values exceed AWQS and/or MCL

In June 1997, Fluor Daniel prepared a field report that documented the well drilling and sampling activities and presented the analytical results. However, per contract requirements with ADEQ, interpretation of the data was not provided. Subsequent to the completion of the field report by Fluor Daniel, WESTON prepared a letter report that presented an interpretation of the groundwater quality data obtained by Fluor Daniel (WESTON, 1997). The following conclusions were summarized in the report:

- PCE, TCE, and 1,1-DCE were present at concentrations significantly exceeding the EPA MCLs in the groundwater collected from all three monitor wells. Groundwater collected from monitor well WCP-16 had the highest contaminant concentrations, with PCE at 1,500 to 1,700 micrograms per liter (µg/L), TCE at 2,600 to 2,700 µg/L, and 1,1-DCE at 270 to 290 µg/L.
- Monitor well WCP-16 contained groundwater with the highest detected concentrations of contaminants and is located immediately east of a building foundation on the property. The building foundation area was found to have elevated VOC concentrations in soil-gas samples, as reported by Univar (HLA, 1994). However, information on operations that may have been conducted at the building was not available.
- VOCs were detected in soil samples collected from the property, but the detections were sporadic and did not show a consistent pattern.
- Groundwater flow directions at the VW&R facility varied from northwest to southwest, which appear to be in response to pumping of Salt River Project (SRP) Well 10.5E-7.5N, located less than 2,000 feet west of the VW&R facility. Based on the variability of groundwater flow directions obtained at the facility, it was not possible to evaluate the potential source area of the contaminants without additional data. There appeared to be a source in the vicinity of monitor well WCP-16; however, additional upgradient wells were required to determine if the source area was on the VW&R facility or originated from an off-site, upgradient source.

1.3.5 Phase II Remedial Investigation Report (WESTON, 1998)

In 1998, ADEQ contracted WESTON to initiate a Phase II RI at the VW&R facility to evaluate the lateral extent of groundwater contamination beneath the facility and in the WCP East Grand Avenue WQARF Site, based on groundwater flow at the time, and to identify the potential

source areas of the release (WESTON, 1998). Two monitor wells, WCP-28 and WCP-29, were installed upgradient and one monitor well, WCP-30, was installed downgradient from the VW&R facility (Figure 1-8).

Soil samples were collected in 10-foot intervals during the well installations. The soil headspace for each sample was analyzed with a flame ionization detector (FID). No soil samples were submitted for laboratory VOC analysis. A composite sample collected from the soil cuttings from the well installations was submitted to an off-site laboratory for VOC analysis to characterize the material for disposal purposes. There were no VOCs detected in the soil during the soil headspace screening or the disposal characterization analysis.

Groundwater was sampled from WCP-15, WCP-16, WCP-17, WCP-28, WCP-29, and WCP-30 during two groundwater sampling events. Groundwater samples were submitted for VOC analyses by EPA Methods 601/602. Static water levels were also collected from the six monitor wells to evaluate the direction and gradient of groundwater flow near the facility.

Concentrations of PCE, TCE, and 1,1-DCE were detected in samples collected from all six wells during both sampling events at concentrations exceeding their respective EPA MCLs. Groundwater elevation data collected during the Phase II RI indicated that the groundwater flow direction in the vicinity of the VW&R facility was to the southwest when the SRP well was not pumping.

WESTON prepared a report summarizing the Phase II RI activities and describing the nature and extent of VOC contamination in the soil and groundwater based on interpretation of the Phase II RI data and previous investigations (WESTON, 1998). The following sections summarize the findings presented in the Phase II RI Report.

1.3.5.1 Soil Contamination

Although no soil samples were submitted for laboratory VOC analyses during the Phase II RI, previous subsurface investigations showed that observed detections of VOCs occurred at the top of fine-grained units, suggesting that lateral migration of VOCs may have occurred at the

facility. The VOC concentrations were not elevated in soil samples collected along any of the property boundaries, and the soil samples with the most numerous VOC detections were collected from the center of the property. In the Phase II report, WESTON disagreed with HLA's hypothesis that the VOC contamination observed in subsurface soil was attributable to impact from soil-gas migration from an off-site source. WESTON proposed additional drilling and subsurface soil sampling to further delineate the VOC contamination and trace it back to the source(s).

1.3.5.2 Groundwater Contamination

Detected concentrations of PCE, TCE and 1,1-DCE were above the MCLs for groundwater samples analyzed prior to 1998 from monitor wells near the VW&R facility. The observed VOC concentrations were highest in the groundwater collected from the on-site and downgradient monitor wells, indicating that the VW&R facility was a source of the contamination present in the groundwater. The presence of VOCs in upgradient wells, however, indicated that the upgradient extent had not been defined. WESTON proposed that further groundwater investigation was needed to define the lateral extent and evaluate the vertical extent of VOC contamination.

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